



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
Diploma(Electrical Engineering)
(2023-2026)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
DTEE601N	DCC	Control System	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To give the concept of control system & its applications in various fields.
2. To learn concept of modeling of various physical systems.
3. To learn about the performance characteristics and limitations associated with various devices.

Course Outcomes:

After the successful completion of this course students will be able to

1. Demonstrate an understanding of the fundamentals of (feedback) control systems.
2. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
3. Apply root-locus technique to analyze and design control systems.
4. Determine the (absolute) stability of a closed-loop control system.

Syllabus

UNIT-I

8 Hrs.

Introduction: Basic concept of open loop and closed loop control system and their comparison- Simple Mathematical model of physical systems-Analogy between different systems-Mechanical and Electrical.

UNIT-II

8 Hrs.

Control System Representation: Transfer function, block diagram, reduction of block diagram, Mason's gain formula, Simple Mathematical problems on block diagram and signal flow graphs.

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UNIT-III

9 Hrs.

Time Domain Analysis: First and Second order control System (Without mathematical treatment)- Definition of different performance indices as delay time, rise time, peak time, percentage peak overshoot, Settling time, steady state error.-Type-0, Type -1, type-2, system definition-Concept of stability: absolute stability, relative stability-Routh and Hurwitz Criteria for stability.

UNIT-IV

8 Hrs.

Root Locus Techniques: Introduction-Root Locus concept, Construction of Root Loci.

UNIT-V

9 Hrs.

Frequency Domain Analysis: Introduction- Nyquist Stability Criteria and Bode plots of simple control system.

References:

1. I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
2. Control Systems by Ashfaq Hussain, Haroon Ashfaq, Dhanpat Rai & Co.
3. Rudra Pratap, Getting Started with MATLAB, Oxford.
4. Modern Control Systems by Roy Chaudhary. PHI
5. Feedback Control Systems by Dr. S.D. Bhide, R.A. Barapate, S. Satyanarayan, Tech-Max Publication, Pune

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List of Experiments:

1. Determination of transfer function of A-C servomotor
2. Determination of transfer function of D-C motor.
3. Study of Block diagram reduction Method using MATLAB
4. To Plot Root Locus using MATLAB.
5. To Plot Nyquist plot using MATLAB
6. To Plot Bode plot using MATLAB
7. Effect of adding poles on root loci of type-1, type-2 systems through MATLAB.
8. Effect of adding zeros on root loci of type-1, type-2 systems through MATLAB.
9. Effect of adding poles on bode plots of type-1, type-2 systems through MATLAB.
10. Effect of adding zeros on bode plots of type-1, type-2 systems through MATLAB.

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DTET502	DC	Embedded Systems	60	20	20	30	20	3	0	2	4

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Course Educational Objectives (CEOs):

1. To introduce students to smart devices and how they work in everyday life (like washing machines, mobile phones, and cars).
2. To teach programming of small computers (microcontrollers) that control real-world devices.
3. To develop skills in connecting sensors, displays, and motors to create intelligent systems.
4. To build practical projects that solve real problems using embedded technology.

Course Outcomes (COs):

After completing this course, students will be able to:

1. Understand embedded systems, working smart devices around us work and their applications.
2. Write simple microcontroller programs to control LEDs, motors, and sensors.
3. Interface hardware and connect different components like displays, keyboards, and sensors to microcontrollers.
4. Design practical projects like digital clocks, temperature controllers, and security systems.

Syllabus

UNIT I

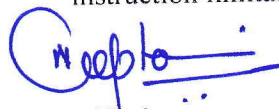
7 Hrs.

Introduction to Embedded system. Characteristics: Real-time operation, low power, small size, reliability Types of embedded systems, Applications in daily life, Basic architecture: Processor, Memory, Input/Output, Software. Difference between general-purpose computers and embedded systems

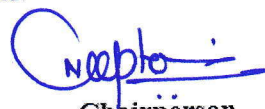
UNIT II

8 Hrs.

Introduction to 8051 Microcontroller: Why 8051 is popular for learning Pin diagram and basic architecture CPU, Memory (RAM, ROM), Timers, Interrupts Memory organization: Program memory vs Data memory Special function registers (SFRs) Input/Output ports: Port 0, 1, 2, 3 functions Reading switches and controlling LEDs Addressing modes: Immediate, Direct, Indirect addressing (with simple examples) Basic instruction set: Data transfer, arithmetic, logical, branch instruction limitations.



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DTET502	DC	Embedded Systems	60	20	20	30	20	3	0	2	4

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UNIT III

8 Hrs.

Programming in C: Basic C programs for 8051, Variables, loops, functions for embedded systems, Basic interfacing.

UNIT IV

8 Hrs.

Communication basics: Serial communication (UART), I2C protocol SPI protocol, Analog to Digital Converter, Digital to Analog Converter, Interrupts, Timer and counters.

UNIT V

10 Hrs.

Real-time concepts: What is real-time? Hard vs Soft real-time systems Task scheduling basics Power management: Sleep modes and power saving.

Text Books:

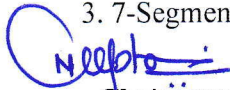
1. Mazidi M. A., "The 8051 Microcontroller and Embedded Systems", Pearson Education, 2nd Edition, 2013.
2. Rajkamal, "Embedded Systems: Architecture, Programming and Design", TMH, 3rd Edition, 2014.

Reference Books:

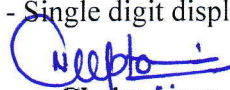
1. Shibu K. V., "Introduction to Embedded Systems", TMH, 1st Edition, 2009.
2. Lyla B. Das, "Embedded Systems: An Integrated Approach", Pearson Education, 1st Edition, 2013.
3. Frank Vahid, "Embedded System Design: A Unified Hardware/Software Introduction", Wiley, 2nd Edition, 2002.

List of Experiments:

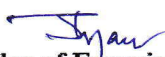
1. Basic LED Control - Blinking LED, LED patterns, traffic light simulation.
2. Switch Interfacing - Reading push buttons, toggle switches.
3. 7-Segment Display - Single digit display, counter, digital clock.


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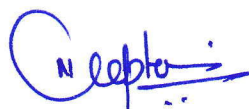
Diploma EI/EX W.E.I. 2024

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DTET502	DC	Embedded Systems	60	20	20	30	20	3	0	2	4

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4. LCD Interfacing - Text display, scrolling messages, menu system.
5. Keypad Interfacing - 4x4 keypad, password entry system.
6. Temperature Monitoring - LM35 sensor, digital thermometer with alarm.
7. Motor Control - DC motor speed control, stepper motor control.
8. Serial Communication - Data transfer between microcontroller and PC.
9. ADC Application - Light intensity measurement, voltage monitoring.
10. Mini Project - Complete system (Security alarm, Automatic water level controller, Digital clock with alarm).



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DTMT502	BEC	Design of Mechatronics System	60	20	20	30	20	3	0	2	5

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Course Educational Objectives (CEOs):

The subject aims to provide the student with:

1. Understanding of Mechatronics system design.
2. Understanding of design process.
3. Implementation of the design process.

Course Outcomes (COs):

Students will:

1. Explain application of mechatronics system.
2. Describe various design processes.
3. Demonstrate approach of mechatronics in day-to-day appliances.

Syllabus

UNIT I

8 Hrs.

Introduction: Mechatronics design issue, key elements of Mechatronics: Information system, Mechanical system, Electrical system, Computer system, Sensors and Actuators,

UNIT II

6 Hrs.

Design process: Type of design, Integrated product design, Mechanism, load condition design and flexibility, structures, man machine interface, industrial design and ergonomics, information transfer, safety.

UNIT III

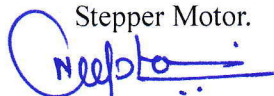
8 Hrs.

Real time interfacing: Advanced approaches in Mechatronics. elements of Data Acquisition and Control System, overview of I/O process, Installation of I/O chard and software.

UNIT IV

8 Hrs.

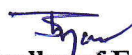
Case Study: Thermal cycle Fatigue of a Ceramic Plate, PH control system, De-Icing Temperature Control System, Skip control of CD player, speed control of a DC Motor and speed control of a Stepper Motor.



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DTMT502	BEC	Design of Mechatronics System	60	20	20	30	20	3	0	2	5

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UNIT V

9 Hrs.

Case Study (Mechatronics): Pick and Place robot, car park barrier system, Automatic Camera, car engine management system, Bar Code Reader, coin counter, automatic washing machine, automatic windscreen wiper in Car Systems, automatic room heating system, Intelligent Mechatronic Devices.

Text Books:

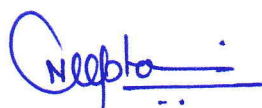
- 1.Devdas Shetty, Richard A. Kolk, "Mechatronics System Design", 2nd Edition, Cengage Learning 2011.
- 2.Georg Pelz, "Mechatronic Systems: Modeling and simulation" with HDLs, John Wiley and sons Ltd, 2003.

References:

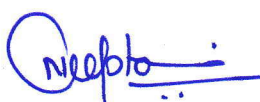
- 1.Bishop, Robert H, "Mechatronics Handbook", CRC Press, 2002.
- 2.Bradley, D. Dawson, N.C. Burd and A.J. Loader, "Mechatronics: Electronics in Products and Processes", CRC Press 1991, First Indian print 2010.
- 3.De Silva, "Mechatronics: A Foundation Course", Taylor and Francis, Indian Reprint, 2013.

List of Experiments.

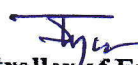
1. To study mechatronics systems and elements of mechatronics systems.
2. To study and analysis of Mechatronics products and systems in manufacturing.
3. To perform various PLC Ladder logics through Siemens PLC kit and Step-7 Micro/Win software.
4. To design and develop networks for control valve study on H- simulator and P- simulator
5. To perform an experiment using Electro pneumatic kit.
6. To perform function of X-Y table and conveyer belt using PLC interface with PC.
7. Analysis of Speed control stepper and servo motor using microprocessor kit.
8. Design program for Pic and Place Robot.
9. To make ladder logic for Automatic door opening and closing.
10. To study and perform control valves function on electro pneumatic trainer kit.


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DTET504		PLC Lab	0	0	0	30	20	0	0	4	2

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Course Educational Objectives (CEOs):

To understand the concept of:

1. Fundamentals of Programmable Logic Controllers and their industrial applications.
2. PLC programming using Ladder Logic and basic programming languages.
3. Interfacing input/output devices with PLC systems.

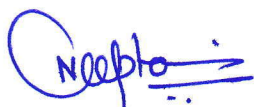
Course Outcomes (COs):

After completing the course students will be able to:

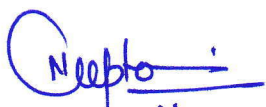
1. Explain the architecture and working principles of PLC systems.
2. Develop ladder logic programs for basic industrial automation applications.
3. Interface sensors, actuators, and control devices with PLC.
4. Troubleshoot and commission simple PLC-based control systems.

List of Experiments:

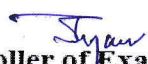
1. Study of PLC hardware architecture and I/O modules.
2. Introduction to PLC programming software and ladder logic basics.
3. Programming exercises on basic logic gates (AND, OR, NOT, NAND, NOR) using PLC.
4. Programming for motor control applications:
 - o Single motor start/stop control
 - o Forward-reverse motor control
5. Programming for timers and counters:
 - o ON-delay timer application
 - o OFF-delay timer application
 - o Up counter and down counter applications
6. Design and implementation of sequential control circuits using PLC.
7. Traffic light control system simulation using PLC.
8. Automatic star-delta starter control using PLC.
9. Conveyor belt control system using PLC.
10. Temperature monitoring and control using PLC with analog inputs.



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DTET504		PLC Lab	0	0	0	30	20	0	0	4	2

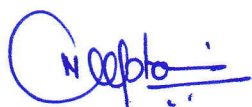
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Text Books:

1. Frank D. Petruzella, "Programmable Logic Controllers", 6th Edition, McGraw-Hill Education, 2022.
2. M. T. White, "PLCs for Beginners: An Introductory Guide to Building Robust PLC Programs with Structured Text", Packt Publishing, 2024.

Reference Books:

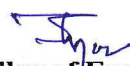
1. Gary A. Dunning, "Introduction to Programmable Logic Controllers", 3rd Edition, Delmar Cengage Learning, 2006.
2. Ashraf Said AlMadhoun, "PLC SCADA for Beginners: Understanding and Implementing Industrial Automation Systems", Springer, 2023.
3. Himanshu Kumar, "Advanced Industrial Automation: PLC Programming in Simplest Way with 110 Solved Examples", Notion Press, 2020.
4. R. G. Jamkar, "Industrial Automation Using PLC SCADA & DCS", Dreamtech Press, 2019.



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